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ADJUSTING THE RF ANALOG REGISTERS

ON PN512

VERSION 1.1

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ABSTRACT

The goal of this document is to show how by changing RF reader's parameters can solve possible problems in communication with the tag (card). These problems can occur mainly with readers that have a built-in RF amplifier (RF Range Booster).

Example 1: Communication with some type of card at distance of 2 cm is problematic. You can try to increase the level of the threshold and reduce the gain of the receiver.

Example 2: It is necessary to increase the operational distance for the some type of card by 5mm. You can try to increase gain of receiver.

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Setting several registers may change the behavior of the device (reading distance, quality of communication with tag, etc.) These registers affect the parameters of the receiver and the transmitter.

RFCfgReg configures receiver gain and RF level detector sensitivity. Increasing the gain of the receiver can increase the operation distance, but the influence of the environment increases. As a result, the number of errors in communication with the tag can be increased (especially at a certain problematic distance).

RF level detector uses in card emulation mode and NFCIP1 peer to peer protocol. To increase the sensitivity of the RF level detector, an amplifier can be activated by setting the bit RFLevelAmp in register RFCfgReg to 1.

RxThresholdReg sets the threshold values for the bit decoder and is composed of MinLevel and CollLevel. The MinLevel defines the minimum signal strength at the correlator output that shall be accepted. The MinLevel defines a threshold level for the internal decoder, which requires a signal that exceeds the noise by some amount to be detected. The higher level of the threshod allows more robust communications with fewer errors, but the operational distance is reduced.

The transmitter pins TX1 and TX2 have P-MOS and N-MOS pair of MOSFET (push-pull). Several registers define conductance of P and N drivers.

GsNOnReg defines conductance of N driver during period of modulation, and period of no modulation.

CWGsOReg defines the conductance of the P-driver during times of no modulation.

These registers may be used to regulate the output power and subsequently current consumption and operating distance. For communication where uses 100% ASK modulation (Type A), conductance of P-driver during modulation is maximal, and they can not be setting. If device has the RF amplifier, the impact of these registers is lower.

The ModGsPReg defines the conductance of the output P-driver during modulation. It is mainly used to adjust the modulation index for Type-B. The value depends on the antenna tuning and the final environment.

Changing of RF analog registers is possible using the command RFConfiguration. Using this command can be set up analog settings for the baudrate 106 Kbps type A, or baudrate 212/424

Kbps, or type B.

If you use one of Digital Logic NFC RFID reader writer devices, you can use the several functions included into dll.
Example: Type A SetRfAnalogRegistersTypeA, or SetRfAnalogRegistersTypeATrans (with driver's conductance setting) of SetRfAnalogRegistersTypeADefault (Factory default setting of these registers).

PC/SC RFID smart card reader DL533R based on PR533 chip, and DL533N CS OEM NFC RFID reader writer based on PN533. Both of PR533 and PN533 have the integrated PN512 chip.

If the DL533R reader is used then no other smart card reader must be connected, and any card must be detected by reader (for software example PR533_RF_setting.exe)

To use the DL533R reader it is necessary to enable ESCAPE IOCTL.
This IOCTL is mandatory for SCardControl routines so it must be enabled for proper reader operation.

1   Open the Registry Editor:
     Click on the Start /Run and type "regedit" and click OK;

2   Open the DL5333R registry directory:

     Under Windows XP, the following key must be opened:
     -> HKEY_LOCAL_MACHINE (see *Figure 1*)
     -> SYSTEM
     -> ControlSet001
     -> Enum (see *Figure 2*)
     -> USB
     -> VID_1FC9&PID_010B (see *Figure 3*)
     -> 3.50 or 3.60 – (depending on reader's firmware version);
     -> Device Parameters
     Under Windows 7 or higher, it is mandatory to go to directory
     -> WUDFUsbccidDriver. (see *Figure 4*)

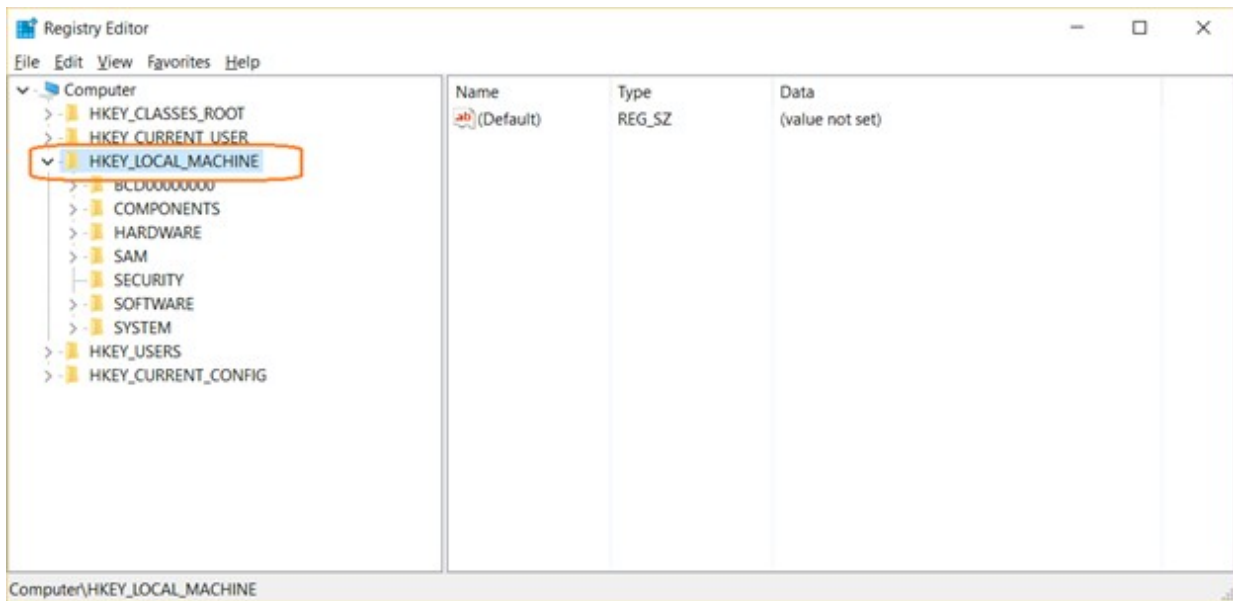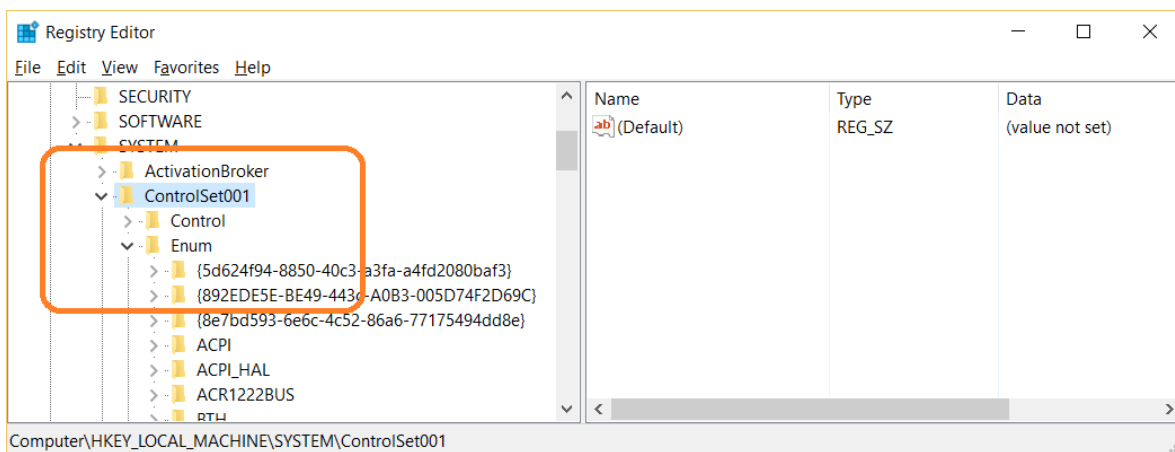3   REG_DWORD EscapeCommandEnable has to be created and equal to 0x01 (see *Figure 4*)
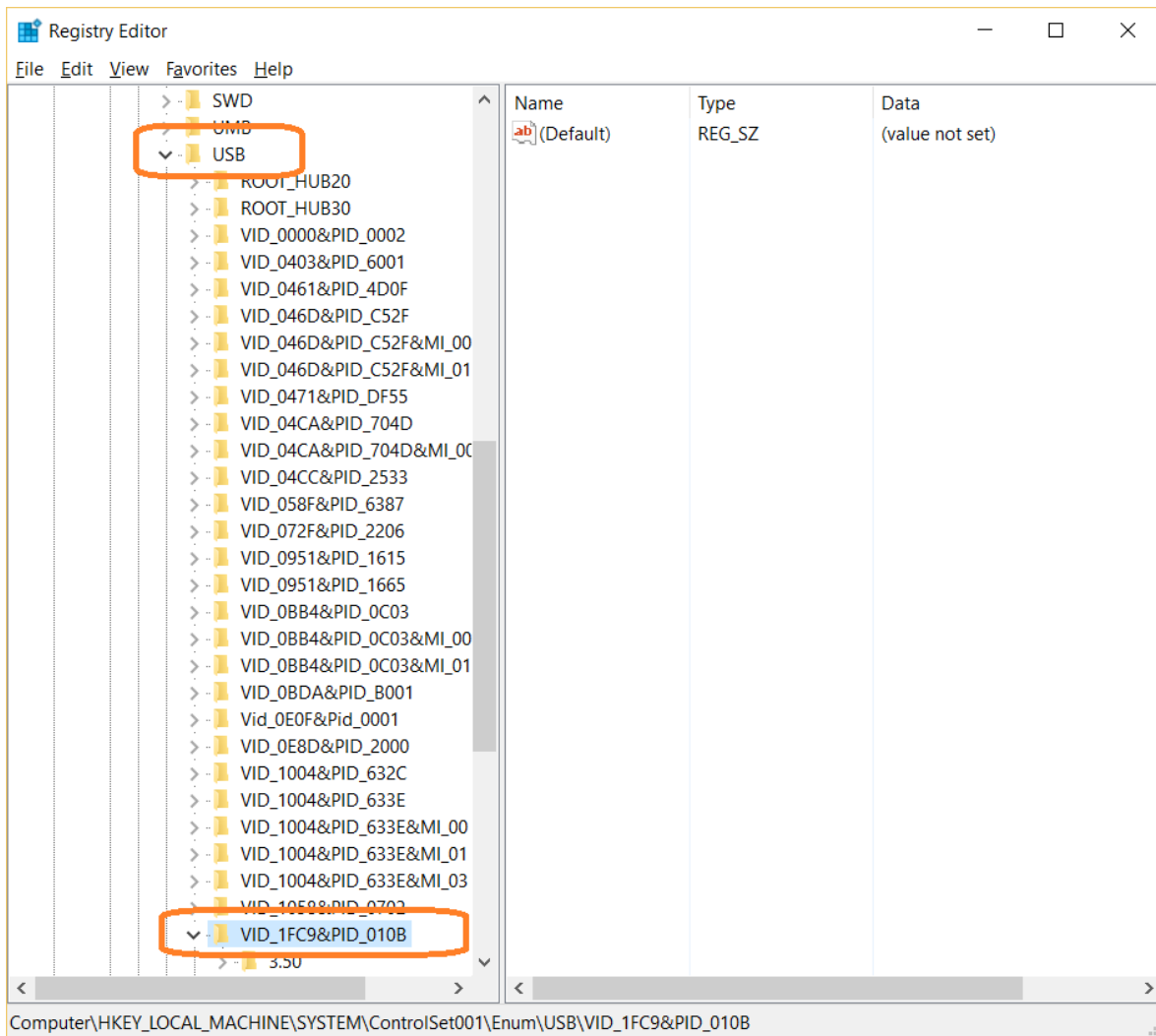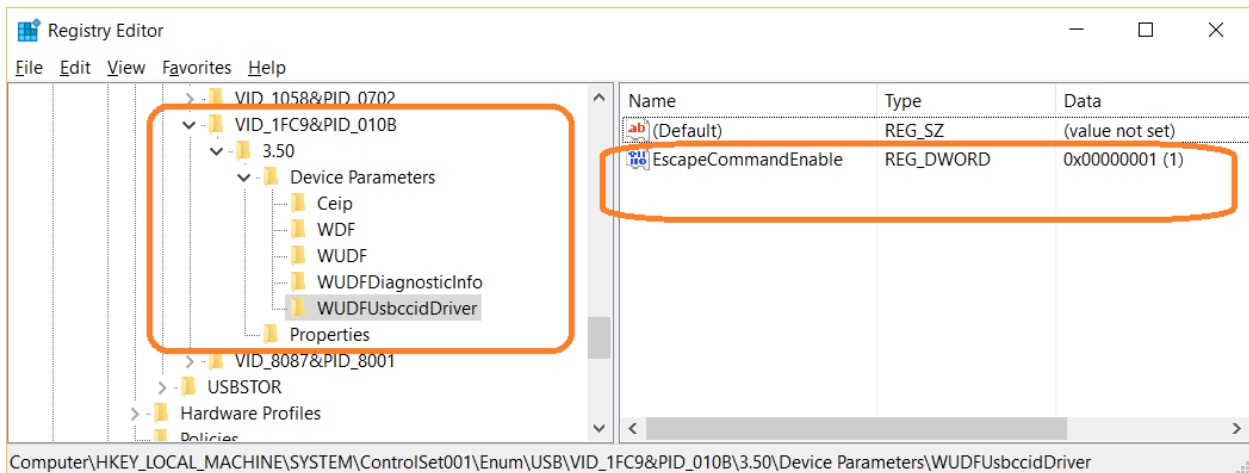
Figure 1

Figure 2

Figure 3

Figure 4

4   If this key does not exist, add it:
     Right click on the window;
     Select DWORD value;
     Set the name "EscapeCommandEnable" and value "1" and Click OK.

5   Close the Registry Editor and restart the computer.

After restart, you will be ready to use DL533R reader device.

Revision history

Date	Version	Comment
2017-12-04	1.0	Base document
2018-06-26	1.1	Instructions for use the DL533R